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FOREST RESEARCH NOTES



NORTHEASTERN FOREST EXPERIMENT STATION

Upper Darby, Pennsylvania

No. 80
1958

RESULTS 18 YEARS AFTER PLANTING LOBLOLLY PINES AT DIFFERENT SPACINGS

In 1939 a test of four spacings in planting loblolly pine seedlings was begun in an abandoned field on Maryland's Eastern Shore. The spacings were 4, 5.7, 8, and 11.3 feet between trees; each spacing was replicated on four 100-foot-square plots. In the 4- and 8-foot spacings, rows and trees within rows were 4 or 8 feet apart, with trees opposite in adjoining rows. In the other two spacings, trees in adjoining rows were staggered. Trees 8 feet apart staggered in rows 4 feet apart gave the 5.7-foot spacing; trees 16 feet apart in rows 8 feet apart gave the 11.3-foot spacing.

1957 Measurements

Eighteen years later, before the 1957 growth started, trees were measured in each plot inside an isolation strip that extended to midway between the first and second rows from a plot edge. All planted trees, and all volunteers by species, were tallied separately by 1-inch diameter (breast high) classes. On twenty representative planted trees in each plot, total height was also measured.

Effect On Planted Trees

In 1957, the number of living planted trees per acre, their average diameter and basal area and volume, varied with the original spacing. There were 1,067 more planted trees per acre at the closest spacing than at the widest (table 1). Although 40 to 54 percent of the planted trees in all spacings had died since 1939, only at the closest spacing had competition apparently caused some mortality.

The 1957 measurements showed that, the closer the original planting, the greater the basal areas and total cordwood volumes (table 1). At the 4-foot spacing, basal area of planted trees per acre was 130 percent more than at the 11.3-foot spacing, and the volume in trees 4 inches d.b.h. and larger was 75 percent more. However, when only pines 6 inches d.b.h. and larger are considered, the 8-foot spacing showed the greatest cordwood volume (table 1).

Most of the per-acre volume differences are due to the effect of spacing on number of trees and diameter growth, not on tree height. The average diameter of planted pines increased from 4.5 inches at the 4-foot original spacing to 7.7 inches at 11.3 feet (table 1). But average and maximum heights tended to increase only slightly with greater distance between trees; within a diameter class, heights tended to decrease with wider spacing (table 2).

Table 1.--Number of planted pines living in 1957, their average diameter, basal area, and volume per acre, by spacings

Original spacing of planted trees	Trees per acre	Average diameter (b.h)	Basal area per acre	Volume per acre in trees ¹ --	
				4 inches d.b.h. and larger	6 inches d.b.h. and larger
<i>Feet</i>	<i>Number</i>	<i>Inches</i>	<i>Sq. ft.</i>	<i>Cords</i>	<i>Cords</i>
4	1,258	4.5	141.5	17.8	7.7
5.7	738	5.4	116.8	16.5	12.0
8	411	6.6	98.3	15.7	14.4
11.3	191	7.7	61.5	10.2	9.9

¹Volume in cords of rough wood above a 1-foot stump to a top diameter (i.b.) of 3 inches. Table values were computed using field measurements and Table 3 of U.S. Dept. Agr. Misc. Pub. 50, "Volume, yield, and stand tables for second-growth southern pines."

Table 2.--Average heights of sample trees in relation to spacing and present diameter

Original spacing of planted trees	Diameter (b.h.), in inches					All sizes
	4 to 5	6 to 7	8 to 9	10 to 11	12	
<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>
4	32.8	36.3	40.0	--	--	34.7
5.7	32.4	36.2	39.8	42.0	--	35.2
8	31.7	36.0	39.7	42.7	--	36.6
11.3	31.1	33.9	37.8	40.5	46.0	36.0
All spacings	32.4	35.6	38.9	41.0	46.0	35.6

Table 3.--Number of volunteer trees per acre, total basal area of all trees, and total volume of pine, by original spacing of planted trees

Original spacing of planted trees	Volunteers per acre ¹		Basal area per acre of all trees ¹	Volume per acre in pines ² --	
	Pines	Pines and hardwoods		4 inches d.b.h. and larger	6 inches d.b.h. and larger
<i>Feet</i>	<i>Number</i>	<i>Number</i>	<i>Sq. ft.</i>	<i>Cords</i>	<i>Cords</i>
4	71	241	150.3	18.2	7.8
5.7	179	488	132.2	17.2	12.3
8	285	707	123.0	17.3	15.2
11.3	829	917	108.0	14.7	12.6

¹Includes trees 0.6 inch d.b.h. and larger.

²Includes both planted and volunteer pines.

Volunteer Trees

Many volunteer trees have become established on the plots, roughly in inverse proportion to the density of the planting (table 3), thus tending to equalize the total densities of stocking. For instance, the difference in number of planted trees between the closest and widest spacings was 1,067 per acre, but this difference drops to 391 trees per acre (stems 0.6 inch d.b.h. and larger) when volunteers also are counted. The narrowing of differences in stocking density is reflected in basal areas and volumes. Maximum difference in basal area per acre was 80 square feet for planted trees, 42 square feet when volunteers were included; in volume of pine stems 4 inches d.b.h. and larger, maximum difference was 7.6 cords for planted trees, 3.5 cords with pine volunteers included (tables 1 and 3). Although we have no measure of it, growth response to the different spacings doubtless was reduced in some degree by competition from the volunteers.

Conclusions

In view of the above results, present spacing practices in plantings on the Eastern Shore seem satisfactory. The most common one, 6 feet by 7 feet, is probably best, particularly where commercial row thinnings for pulpwood are feasible in stands 15 to 20 years old. An 8-foot spacing will provide larger trees, but it results in larger limbs and slower natural pruning. However, where some volunteer pines can be expected, an 8-foot spacing can be recommended. Wider spacings produce too limby trees, and a 4-foot spacing too spindly trees, to be advisable.

The results and conclusions from this study agree fairly closely with those from more extensive trials in the South (1, 2).

Literature Cited

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